Remarks

The Applicants have amended the Specification in various locations to place it into more contemporary form. Entry into the official file is respectfully requested.

The Applicants have added new Claims 16-18. They depend from Claims 6, 11 and 13, respectively. Support may be found in the Applicants' Specification on Page 20 at Line 4, for example. Examination on the merits is respectfully requested.

The Applicants note the rejection of Claims 6 – 7, 11 and 13 under 35 U.S.C. §103 over JP '725. The Applicants also note the Examiner's helpful comments concerning the hypothetical application of JP '725 to those claims, particularly the portion regarding "the instant steel composition and method steps are overlapped by the cited reference." The Applicants respectfully submit that there are substantial differences between JP '725 and those rejected claims. Detailed reasons are set forth below.

Claim 6 is directed to a method of producing a high tensile strength hot-rolled steel sheet. The sheet has superior strain aging hardenability with a tensile strength of 440 MPa or more. The steps include heating a slab to 1000°C or more, rough rolling the steel slab to form a sheet bar, finish rolling the sheet bar at a finishing temperature of 800°C or more, cooling at a cooling rate of 20°C/s or more within 0.5 seconds after the finish rolling, and coiling at a temperature of 650°C or less. The steel slab that is heated has a composition of 0.15% or less of C, 2.0% or less of Si, 3.0% or less of Mn, 0.08% or less of P, 0.02% or less of S, 0.02% or less of Al and 0.0050% to 0.0250% of N. There are also optional components that may be added to the composition to further improve its characteristics.

On the other hand, JP '725 is directed to a hot rolled steel sheet that employs a different composition and different methodology.

JP '725 relates to a method for manufacturing a hot-rolled steel sheet of a compound structure having high-strength and high-workability and excellent crash worthiness. JP '725, however, does not disclose the following specifically claimed elements of the rejected claims:

(1) Nitrogen (N) content of 0.0050 to 0.0250%

(2) N/Al is 0.3 or more

(3) Cooling within 0.5 seconds after finish rolling at a cooling rate of 20°C/s

Referring to the Abstract of JP '725 as noted by the Examiner, the JP '725 Abstract discloses the steel composition of 0.05% – 0.4% of C, 1.0% – 3.0% of Si, 0.6% – 3.0% of Mn and 0.2% – 2.0% of Cr. What is important with respect to the disclosure of the JP '725 Abstract is that there is no reference to N at all. This is sharply contrasted to the 0.0050% to 0.0250% of N recited in Claims 6-7, 11 and 13. Thus, the Applicants' Claims 6-7, 11 and 13 recite a specific amount of N while the JP '725 Abstract does not disclose N at all, much less in the claimed amount. The Applicants therefore respectfully submit that the JP '725 Abstract is not only inapplicable to Claims 6 – 7, 11 and 13, but that it is non-enabling as prior art against those claims. The Applicants therefore respectfully submit that there is no overlap between Claims 6 – 7, 11 and 13 with respect to the JP '725 Abstract. Withdrawal of the rejection on this basis alone is therefore entirely appropriate. The Applicants therefore respectfully request withdrawal of the rejection.

However, there is at least one other difference. For example, Claims 6 and 11 recite the method steps of finish rolling the sheet bar at a finishing temperature of 800°C or more, cooling at a cooling rate of 20°C/s (40°C/s in the case of Claim 13) or more within 0.5 seconds after finish

rolling and then coiling at a temperature of 650°C or less. The JP '725 Abstract takes a different approach. There is a finish rolling step at 780° – 980°C. This is followed by cooling to 620° – 720°C. It is important to note that there is no disclosure of the time of the beginning of such cooling and there is no rate disclosed for such cooling subsequent to the finish rolling step. This is sharply contrasted to Claims 6 and 11 which specifically recite cooling at a cooling rate of 20°C/s (40°C/s in the case of Claim 13) or more within 0.5 seconds after the finish rolling. In other words, the JP '725 Abstract teaches those skilled in the art that the finish rolled product may be cooled to between 620°C and 780°C, but does not disclose when that step should begin and what the cooling rate should be. Only after cooling to the specified time range does the JP '725 Abstract disclose holding for 1 – 10 seconds or slowly cooling at 20°C/s to 350° – 500°C.

The Applicants respectfully submit that there is no overlap in these steps. This is inherently so because the Applicants claimed finish temperature is 800°C or more. In the event that the JP '725 finish temperature is at the upper limit of 780°C, it will already be outside of the Applicants claimed finish rolling temperature and thus beginning cooling at that 780°C is not applicable. On the other hand, if the JP '725 cooling temperature is in excess of 800°C, there will have to have already been some amount of cooling at an undisclosed cooling rate beginning at an undisclosed time which is inherently a failure to disclose the Applicants claimed step of cooling at a cooling rate of 20°C/s within 0.5 seconds after the finish rolling. Thus, the applicants respectfully submit that the JP '725 Abstract is inapplicable to Claims 6 – 7, 11 and 13 for this reason as well. Withdrawal of the rejection of the JP '725 Abstract is respectfully requested.

However, there is still more. A mechanism of increasing the tensile strength (TS) according to Claims 6-7, 11 and 13 is presumed as follows. Namely a substantial magnitude of transposition is

introduced in a steel plate by press processing. By a paint baking processing, N in a solid solution state (solid soluted N) is accumulated in the surroundings of transposition and suppresses the movement of transposition. As a result, a steel plate becomes hard and TS increases. It is important to effectively manifest this effect to make solid soluted N remain in the steel more than the specified quantity. By increasing the quantity of solid soluted N, the force of suppressing the movement of the transposition is heightened. Therefore, it is an indispensable precondition to contain a predetermined quantity or more of solid soluted N in the steel. It is necessary to delicately manage the chemical constitution and manufacturing conditions to make solid soluted N remain in the steel. Because of interaction of Al with N, Al is deposited as AlN in the hot rolling process and plays a role of decreasing N in a solid solution state. This has an additional effect of accelerating the precipitation rate of AlN. The quantitative relations of Al and N is strictly controlled to make N remain in an appropriate amount. Attainment of the above-mentioned composing elements of N content listed in (1) and the ratio of N/Al listed in (2) brings about the dual effects of excessively increasing the N content and reducing the precipitation rate of AlN. Also, attaining this ratio is essential to make N remain in a solid solution state. Even if such control of the composition range mentioned above is conducted, it is important to further perform cooling at a temperature while avoiding a precipitation temperature range to sufficiently suppress the precipitation of AlN. That is, it is necessary to cool with a high cooling rate from an early stage as much as possible after rolling. Controlling the cooling element (3) is indispensable because this reduces the holding time at a high temperature and thereby precipitation of N is suppressed. As a result, solid soluted N, necessary for stably materializing desired strain ageing hardening, can be secured.

In JP '725, matters pertaining to quantitative relations of N, N and Al, and precipitation of AlN in the steel, are not even mentioned. In addition, the element concerning the timing of starting cooling after finish rolling and the cooling rate are not mentioned. From these facts, it is clear that JP '725 does not intend to secure strain aging hardening (increase in TS) by solid soluted N in steel as is the case in Claims 6-7, 11 and 13. In the inventive examples of JP '725, the BH property is described and this means an increase in YP. It is judged, in view of the specified range of chemical composition in JP '725, to have been caused by solid soluted C which is prior art. Also, when taking into account the fact that an increase in TS, which is an achievement of the Applicants, is not achieved by JP '725, it becomes clear that JP '725 is directed to a principle which is different from rejected Claims 6-7, 11 and 13. Withdrawal of the rejection is respectfully requested.

The Applicants note that the rejection of Claim 8 under 35 U.S.C. §103 over the hypothetical combination of JP '601 with JP '725. The Applicants respectfully submit that hypothetically combining JP '601 with the JP '725 Abstract fails to provide teachings or suggestions that would lead one skilled in the art to the subject matter of Claim 8. In that regard, the Applicants have already established that the JP '725 Abstract is non-enabling and, accordingly, inapplicable. JP '601 does nothing to change that. Thus, even if one skilled in the art were to make the hypothetical combination, the resulting methodology would still fail to teach or suggest the subject matter recited in Claim 8. Withdrawal of that rejection is also respectfully requested.

More specifically, JP '601 relates to a method for manufacturing thin-scale hot-rolled steel plate. Elements of Claim 8 that are not disclosed in JP '601 include:

(4) Content of Al is o.02% or less

(5) Content of nitrogen (N) is 0.0050 to 0.0250%

(6) N/Al is 0.3 or more

(7) Cooling within 0.5 seconds after finish rolling at a cooling rate of 20°C/s or more

For the same reason discussed above with respect to JP '725, it is evident that JP '601 has no intention of achieving strain aging hardening (increase in TS) by solid soluted N in the steel. Although there is some description in [0025] of JP '601 that rapid cooling is carried out within one second after rolling at a cooling rate of 30°C/s or more, it goes without saying that inasmuch as optimization of the chemical constitution is not effected, the desired strain aging hardening capability is not possible to be obtained. Therefore, it is believed to be impossible from the disclosure of JP '601, to obtain industrially and stably extensive strain aging hardening steel. Again, withdrawal of the rejection of Claim 8 is respectfully requested.

The Applicants note the rejection of Claims 9, 14 and 15 under 35 U.S.C. §103 over the further hypothetical combination of JP '919 with JP '601 and JP '725. The Applicants note with appreciation the Examiner's helpful comments concerning the theoretical application of JP '919 to those rejected claims. The Applicants respectfully submit that one skilled in the art would not make the hypothetical combination and, even if a hypothetical combination were to be made, the resulting methodology would still fail to teach or suggest the subject matter of Claims 9, 14 and 15.

The Applicants respectfully submit that one skilled in the art would not hypothetically combine JP '919 with JP '725 or JP '601. The reason is that JP '919 is directed to cold rolled sheets. Those skilled in the art are well aware of the major differences between hot rolled sheets and cold rolled sheets. In particular, the Applicants respectfully submit that one skilled in the art would not make the hypothetical combination because the cold rolling and annealing taught by JP '919 of the

hot rolled steel sheets of JP '601 and JP '725 would change, if not destroy, the characteristics sought to be achieved in JP '725 and JP '601. Therefore, one skilled in the art would not look to JP '919.

Moreover, there are no teachings or suggestions to those skilled in the art that the edge heating of JP '919 would apply to the issues raised in the JP '725 and JP '601 disclosures. Also, there are significant differences in the composition of the JP '919 slab as well as other methodology steps. Application of any of these differences to JP '725 and/or JP '601 would change the characteristics of JP '725, for example.

JP '919 concerns a can steel plate which is excellent in formability by drawing. The following elements of Claims 9, 14, and 15 are not disclosed in JP '919:

(8) Content of nitrogen (N) is 0.0050 to 0.0250%

(9) N/Al is 0.3 or more

(10) Cooling within 0.5 seconds at a cooling rate of 20°C/s or more

JP '919 touches the claimed N content of 0.0050%. Nonetheless, it is clearly stated in the text at [0019] of JP '919 that the N content in the steel had better be as small as possible. This clearly conflicts with the intention of Claims 9, 14 and 15. Further, in consideration of the fact that JP '919 does not satisfy elements (9) and (10) provided above and because of the reasons equal to the above-mentioned criteria concerning JP '725 and JP '601, it is clear that JP '919 does not intend to secure strain again hardening (increase in TS) by solution N in the steel as is done by Claims 9, 14 and 15 herein. Furthermore, a cold-rolling process and an annealing process are added after coiling according to JP '919. Hence, JP '919 is completely different in terms of manufacturing processes from Claims 9, 14 and 15.

In any event, the Applicants respectfully submit that, even if the hypothetical combination were to be made, the resulting combination would still fail to teach or suggest the methodology set forth in Claims 9, 14 and 15. For example, the methodology steps would still be sharply different between a combined JP '919/JP '601/JP '725 method relative to Claims 9, 14 and 15. In that regard, there are no teachings in JP '919 that would cure the deficiencies set forth above with respect to the JP '725 Abstract in finish rolling the sheet bar at a finishing temperature of 800°C or more and cooling at a cooling rate of 20°C/s within 0.5 seconds after finish rolling. Withdrawal of the rejection of Claims 9, 14 and 15 is respectfully requested.

In light of the foregoing, the Applicants respectfully submit that the entire application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,

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